

REMARKS

35 U.S.C. § 102 Rejections

The Examiner has rejected claims 7 and 8 under 35 U.S.C. § 102(e) as being anticipated by Hiyoshi.

Hiyoshi does not disclose buildup layers having power planes, ground planes, and signal routing traces formed therein.

Hiyoshi discloses a semiconductor device having semiconductor chips 351-354 mounted on a ceramic substrate 31 with a circular flange 32 around a periphery of the substrate 31 (Column 6, lines 48-55). Copper plates 331 and 332 are bonded to the top and bottom surfaces of the ceramic substrate 31. The flange 32 is bonded to the outer side of the copper plate 331 at the boundary of and on the top surface of the ceramic substrate 31 (Column 6, lines 61-67). The semiconductor chips 351-354 are soldered to the copper plate 331 (Column 7, lines 15-20). Thus Hiyoshi does not disclose buildup layers. Specifically, Hiyoshi does not disclose buildup layers having power planes, ground planes, and signal routing traces formed therein.

Claim 7 has been amended to include buildup layers having power planes, ground planes, and signal routing traces formed therein. Specifically, claim 7 includes the limitation "a package substrate having top and bottom buildup layers, having power planes, ground planes, and signal routing traces formed therein, disposed on a thermally conductive substrate core..."

Therefore, claim 7 is not anticipated by Hiyoshi because claim 7 includes a limitation not disclosed by Hiyoshi.

Claim 8 is dependent on claim 7 and should be allowable for the same reasons as claim 7.

Applicant, accordingly, respectfully requests withdrawal of the rejections of claims 7 and 8 under 35 U.S.C. § 102(e) as being anticipated by Hiyoshi.

The Examiner has rejected claims 10-13, 15, and 18-20 under 35 U.S.C. § 102(b) as being anticipated by Lischner.

Lischner does not disclose a substrate core with a first portion having buildup layers disposed thereon and a second portion being exposed and a heat sink mounted thereto.

Lischner, in this regard, discloses a circuit board assembly 100 with a flip chip package 110, with a heat spreader 140, connected to a printed circuit board 150 (Column 2, lines 14-17). The first substrate 120 has a first surface 125 and a second surface 126. The substrate may have a plurality of levels, which could be called buildup layers, with electrical paths between layers provided by interconnect vias 122. As clearly shown in Figures 1 and 3, these layers completely cover the substrate 120. There is no portion of the substrate 120 that is left uncovered by the buildup layers. Furthermore, the heat spreader, as clearly shown in Figures 1 and 3, is attached to the buildup layers, not the substrate 120. Thus Lischner does not disclose a heat sink being mounted to an exposed portion of the substrate core.

Specifically, Lischner does not disclose a substrate core with a first portion having buildup layers disposed thereon and an exposed second portion with a heat spreader mounted thereto.

Claim 10 has been amended to include a substrate core with a first portion having buildup layers disposed thereon and a second portion being exposed and a heat sink mounted thereto. Specifically, claim 10 includes the limitations "...a thermally conductive substrate core, having first and second portions, and buildup layers being disposed on the first portion of the substrate core, the second portion being exposed from the buildup layers" and "a heat spreader mounted to the second portion of the substrate core..."

Therefore, claim 10 is not anticipated by Lischner because claim 10 includes a limitation not disclosed in Lischner.

Claims 11-13, 15, and 18-20 are dependent on claim 10 and should be allowable for the same reasons as claim 10.

Applicant, accordingly, respectfully requests withdrawal of the rejections of claims 10-13, 15, and 18-20 under 35 U.S.C. § 102(b) as being anticipated by Lischner.

35 U.S.C. § 103 Rejections

The Examiner has rejected claim 9 under 35 U.S.C. §103(a) as being unpatentable over Hiyoshi.

Claim 9 is dependent on claim 7 and should be allowable for the same reasons as claim 7.

Applicant, accordingly, respectfully requests withdrawal of the rejections of claim 9 under 35 U.S.C. §103(a) as being unpatentable over Hiyoshi.

The Examiner has rejected claim 14 under 35 U.S.C. §103(a) as being unpatentable over Lischner.

Claim 14 is dependent on claim 10 and should be allowable for the same reasons as claim 10.

Applicant, accordingly, respectfully requests withdrawal of the rejections of claim 14 under 35 U.S.C. §103(a) as being unpatentable over Lischner.

The Examiner has rejected claims 16 and 17 under 35 U.S.C. § 103(a) as being unpatentable over Lischner, as applied to claim 10 above, and further in view of Hembree.

Claims 16 and 17 are dependent on claim 10 and should be allowable for the same reasons as claim 10.

Applicant, accordingly, respectfully requests withdrawal of the rejections of claim 16 and 17 under 35 U.S.C. §103(a) as being unpatentable over Lischner, as applied to claim 10 above, and further in view of Hembree.

The Examiner has rejected claims 21 and 23 under 35 U.S.C. § 103(a) as being unpatentable over Kohara in view of Lischner.

Kohara and Lischner do not teach or suggest a substrate core with a first portion having buildup layers disposed thereon and a second portion being exposed and a heat sink mounted thereto.

Kohara teaches a semiconductor device including a flange 2 and flip chips 6 mounted to a module base board 7. The flange 2 is also mounted to a heat sink 1. Kohara makes no mention of a package substrate with layers formed thereon. Specifically, Kohara does not teach a package substrate with a substrate core having a first portion with buildup layers disposed thereon and a second portion being exposed, that is, not covered by the buildup layers.

As previously discussed, Lischner adds nothing to Kohara in this regard.

Claim 21 has been amended to include a substrate core with a first portion having buildup layers disposed thereon and a second portion being exposed and a heat sink mounted thereto. Specifically, claim 21 includes the limitations "...a thermally conductive substrate core, having first and second portions, and buildup layers being disposed on the first portion of the substrate core, the second portion being exposed from the buildup layers" and "a heat spreader mounted to the second portion of the substrate core..."

Therefore, claim 21 is patentable over Kohara in view of Lischner because claim 21 includes limitations that are not taught or suggested by Kohara and Lischner.

Claim 23 is dependent on claim 21 and should be allowable for the same reasons as claim 21.

Applicant, accordingly, respectfully requests withdrawal of the rejections of claims 21 and 23 under 35 U.S.C. §103(a) as being unpatentable over Kohara in view of Lischner.

The Examiner has rejected claims 22 under 35 U.S.C. § 103(a) as being unpatentable over Lischner and Kohara, as applied to claim 21 above, and further in view of Khandros.

Claim 22 is dependent on claim 21 and should be allowable for the same reasons as claim 21.

Applicant, accordingly, respectfully requests withdrawal of the rejections of claim 22 under 35 U.S.C. §103(a) as being unpatentable over Lischner and Kohara, as applied to claim 21 above, and further in view of Khandros.

Applicant respectfully submits that the present application is in condition for allowance. If the Examiner believes a telephone conference would expedite or assist in the allowance of the present application, the Examiner is invited to call Stephen M. De Clerk at (408) 720-8300.

Please charge any shortages and credit any overages to Deposit Account No. 02-2666. Any necessary extension of time for response not already requested is

hereby requested. Please charge any corresponding fee to Deposit Account No. 02-2666.

Respectfully submitted,

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